HYSTER
TAKE IT TO EXTREMES

P.I.B. Product Information Bulletin

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Subject: Tire Options – Class I, IV & V

Description:
There are as many different types of tires for industrial lift trucks, as there are types of trucks. Just as a lift truck is customized for a specific job, so must its tires be designed to suit the operation. Improper selection and product misuse contribute to loss of tire efficiency and premature failure. Hyster Company offers three different tire types in our standard price book for class I, IV and V products. These tire types include cushion, pneumatic and solid pneumatic drive and steer. With this in mind the following information was developed as a guide to assist you in making the proper tire selection.

PROPER APPLICATION:

Most industrial lift trucks are designed for either pressed-on solid (cushion) or pneumatic tires, not both.
The Hyster J30-40XMT2 is the exception to this rule. (Refer to Product Information Bulletin # 0606.03)

Cushion tires are often the choice indoors where floors are smooth and space is at a premium, while pneumatic and solid pneumatic tires are preferred for outside, where floatation and traction is needed for soft-ground or uneven surfaces.

Choice of the correct tire for an application depends on a number of factors, including:

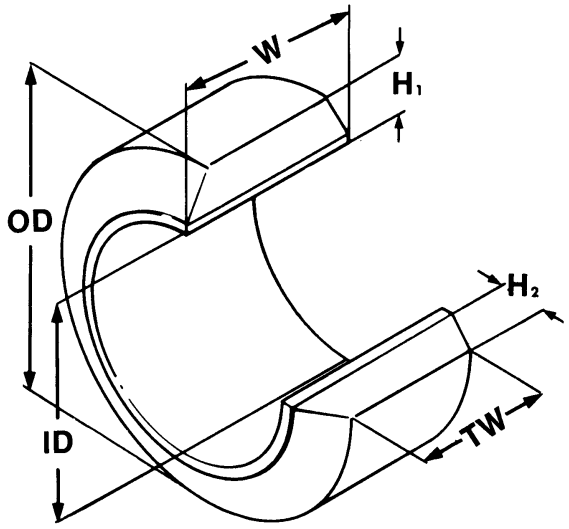
1. Expected maximum tire loads
2. Operating speeds (empty, loaded)
3. Mast type and overall height
4. Type or kind of load usually carried
5. Traction required
6. Floor conditions
7. Capacity requirements

Cushion tires are generally used on free rolling wheels (i.e., trail tires) to extend useful life. They also offer a smoother ride on improved surfaces. Lug or cleat treads can provide superior traction and floatation on less smooth and soft surfaces and are used predominately on drive tires. Load and speed ratings of all tires must be carefully chosen to insure they are capable of handling the loads imposed on them at the truck's operating speed. Performance records of tires in service can warn of improper application, lack of planned maintenance, or abuse.

Keep in mind that the cushion tire will provide a harsher ride on old wood or deteriorated concrete floors, are limited to slower speeds, and transmit more potentially damaging shock or impact load to vehicle, payload, and floor surfaces.

Pneumatic tires on the other hand, because of their cushioned ride, transmit less shock to the vehicle and payload and decrease vehicle and floor maintenance. In addition to being able to operate at higher sustained speeds, they also are available in a wider variety of tread designs and tire construction than solids. However, they require pressure maintenance and are susceptible to punctures.

CUSHION TIRE SPECIFICATIONS



Based Width (W)-- base band width (also equal to tire base width).

High-Load Solid-- tire made of special high-load carrying material, such as polyurethane.

Multiple Tire Rating-- when multiple tires are used as a unit on a single wheel, the maximum load rating is equal to the sum of the individual tire load ratings.

Overall Tire Diameter (OD)--a dimension equal to the sum of the wheel diameter and twice the section height (including base band thickness).

Rubber Section Height (H)--does not include base band thickness.

Section Height (H1)--includes base band thickness.

$$H1 = \frac{OD - \text{actual wheel diameter}}{2}$$

Size Identification--generally appears as a coded sequence of numbers. With pressed-on tires, the first number designates overall tire diameter, the second number is the base width, and the third, the nominal diameter of the wheel or hub on which the tire is to be applied (example: 10 X 5 x 5-1/2).

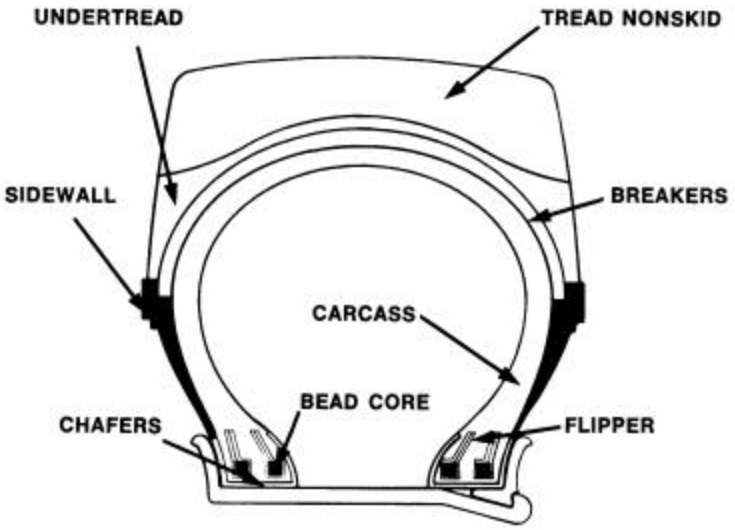
Tread Design Types--the three basic forms are: smooth, grooved, and non-directional traction.

Tread Width (TW)--tread surface width contacting the ground.

Wheel Inner Diameter (ID)--the diameter which corresponds to the inside diameter of the metal base band.

PNEUMATIC TIRES

Pneumatic industrial tires are air inflated to pressures higher than atmospheric pressure. Construction is similar to truck and passenger car pneumatic tires



Designed for a wide variety of uses, they can haul light to heavy loads at relatively high speeds, thus permitting more hauling trips per day than any other type of industrial truck tire.

The industrial pneumatic tire is available as either tube-type or tubeless, in many sizes, tread designs, and ply ratings, and is used on drive wheels and steering or free rolling wheels.

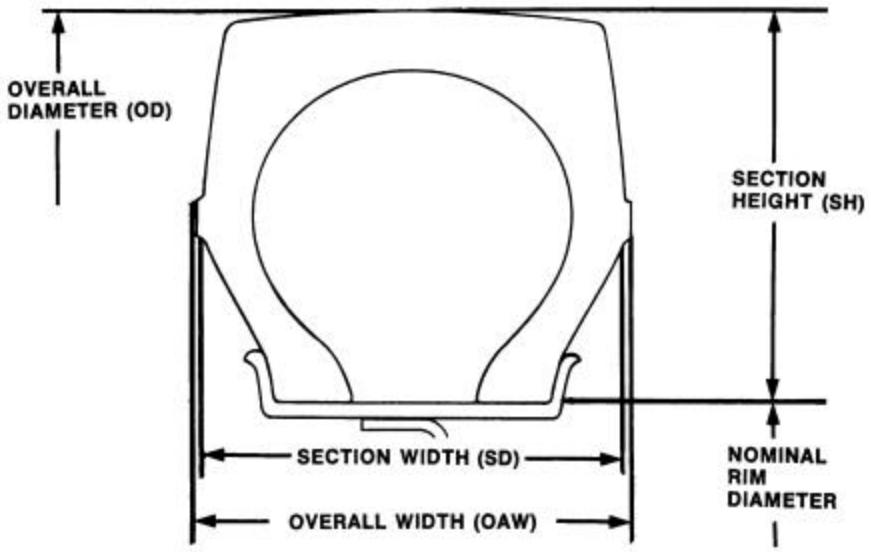
Pneumatic tires are economical, provide excellent surface floatation, and eliminate the need for plank runways on many outdoor operations. Their cushioning action protects fragile loads, minimizes drive fatigue, lengthens equipment life, and reduces floor and equipment maintenance costs.

SOLID PNEUMATIC TIRES:

These tires very closely resemble pneumatic tires but are of solid construction. Commonly referred to as “solid pneumatics,” they mount on the same types of rims as pneumatic tires. They are widely available and have the same size markings as their pneumatic counterparts as well as being available with the same tread designs. Interchangeability is no problem if properly sized rims of adequate strength are used.

“Solid pneumatic” (or Pneumatic Shaped solid) tires are used where higher loads at slower speeds are encountered and in operating environments where debris is present. Since these tires are solid, flats are completely eliminated. These tires can also improve lateral stability, and their ride characteristics are about the same as pneumatic tires.

Pneumatics provide better traction and overall stability when obstacles are encountered, but cushion tires allow more load and wear per comparable size. (For example, an 18 X 6 X 12-1/8 cushion tire is rated to carry a load of 3,800 lb. At operating speeds up to 10 M.P.H., a 6.50 X 10 PR pneumatic could carry the same load. The solid is 5-1/2” smaller in diameter and 1 in. smaller in cross section; the truck body used with cushion tires also could be smaller, and aisle space could be conserved.)



Bead--that part of the tire made of steel wires, wrapped or reinforced by ply cords, that is shaped to fit the rim.

Carcass--the tire structure, except tread and sidewall rubber.

Load Rating (LR)--the maximum load a tire is rated to carry for a given inflation pressure.

Maximum Load Rating-- the maximum load and inflation for a given ply rating and/or LR at a specified speed for given operating conditions.

Maximum Permissible Inflation Pressure--maximum pressure to which cold tire may be inflated.

Overall Diameter (OD)-- diameter measured from the tread centerline of an inflated and unloaded tire.

Overall Width-- the section width, adjusted to include added width from protective side ribs, bars, or decorations.

Percent Deflection-- tire deflection, divided by the unloaded section height above the top of the rim flange, multiplied by 100.

Ply Rating (PR)--an index of tire strength expressed as an equivalent, but not necessarily the actual number, of cord plies in a tire.

Revolutions Per Mile (rpm)--number of revolutions a deflected tire travels in 1 mile.

$$RPM = \frac{5280 \times 12}{2 \prod SLR} = \frac{10084}{SLR}$$

Where static load radius, SLR, is in inches. (See definition on next page)

Rim--a metal support for a tire, or a tire and tube assembly, upon which the tire beads are seated.

Section Height (SH)--radial distance between base of tire at nominal rim diameter radially to a line tangent to outside tread arc at highest point.

$$SH = \frac{OD - \text{Nominal Rim Diameter}}{2}$$

Section Diameter or Section Width (SD)--the callipered width of a new inflated tire, including 24-hr. inflation growth and normal sidewalls, but not including protective side ribs, bars, or decorations as mounted on a standard rim.

Size Identification-- a coded sequence of numbers and letters:

1. **Conventional**-the first number designates approximate section width (SD) and the second the nominal rim diameter (that is, 5.40-10 indicates a tire of approximately 5-1/2 in. cross section and mounted on a 10 in. nominal diameter rim).

2. **Low Profile (or Low SH)-**the first number designates the approximate OD, the second the approximate SD, and the third the nominal rim diameter (that is, 27 x 10-12 indicates a tire with 27 in. OD and 10 in. SD, used on nominal 12 in. diameter. rim).

3. **NHS Designation**--means Not for Highway Service (that is, 6.90-9 NHS).

Static Loaded Radius (SLR)-- the deflected radius of a tire measured from its wheel axis to contact surface, with the tire at rated load and inflation.

$$SLR = \frac{OD}{2} - \text{Radial Deflection}$$

Tire Deflection-- the difference between unloaded and loaded section heights.

Tread--that portion of a tire that comes into contact with the road.

Tread Radius (TR)--the transverse radius of tread curvature (or arc) across tread width, determined by measuring templates of known radii fitted to the convex tread profit.

Tread Width (TW)-- the arc width distance of an inflated tire, as measured across the tread between the extreme tread edges.

SUMMARY

Because tires are so important to the safe and efficient operation of the truck, their initial selection is very important because changing the type of tire in the field is limited. In most cases “solid pneumatic” tires of equivalent size and load rating can replace pneumatic tires, and polyurethane (High Load Pressed-On) tires of the same size can replace standard load pressed-on tires. In any case it is advisable to contact the factory to obtain confirmation that any contemplated tire changes do not compromise safety, durability, or efficient operation of the truck. Although individual preference usually has an influence on whether solid or pneumatic tires should be used, the decision should also be based on such factors as operator comfort, need for puncture protection, operating speed, material being handled, and working atmosphere.

In order to gain complete satisfaction we must customize our products to satisfy the needs of the customer. The information outlined in this bulletin will allow you to show the customer exactly how your sales team stand out from other manufacturers salespeople who are unaware or cannot explain the benefits of selecting the correct tires to meet their application needs.

As always, we appreciate the support of our distribution network and the sales organization.

Sincere Regards,

Peter M. Siessel
Vice President of Marketing – Hyster Company